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## Western Australian Cowries

(Mollusca: Gastropoda)

BY

CRAWFORD N. CATE

12719 San Vicente Boulevard, Los Angeles, California

(Plate 5; 1 Map)

A SEARCH OF PERTINENT LITERATURE reveals that little is known about the distribution of the cowrie fauna of Western Australia. Since MENKE's report "Mollusks of Nova Hollandia" (1843), most of the studies and research on Australian mollusks has been confined to the south-eastern and Queensland regions. H. F. ANGAS worked on this area from 1865 to 1878; JOHN BRAZIER, from 1872 to 1875; and CHARLES HEDLEY, from 1894 to 1908. The work of ANGAS was restricted principally to the study of cowrie distribution in the area of Port Jackson (Sydney); BRAZIER referred to the western species rather generally, and with incomplete data; HEDLEY seems to have produced the first checklist of Western Australian *Cypraea*, drawing upon the reports of other authors to compile his list of 34 species. All these lists furnish information about certain species found at different points in the western area but deal largely in generalities where locality is concerned, and in some instances other data are vague or lacking.

During the past three years, with the able assistance of active collectors in the field, I have endeavored to bring the records up to date, compiling a list of verified species and localities, determining when possible the population centers, and recording other pertinent data not

previously published. The present paper is not intended to be an exhaustive treatment of the Cypraeidae of Western Australia but an attempt to furnish as complete a list as possible of the different known forms. These records will be based entirely upon the field work of men known to me personally and upon specimens in my own collection that carry reliable collecting data.

From the beginning I have had the enthusiastic assistance of one of the most active collectors of *Cypraea* in Western Australia, Mr. A. R. Whitworth; his help has provided the basic framework for nearly all of the present study. I have also had substantial help from Mr. Ted Crake of Broome, who has contributed generously with specimens, maps, and information on ecology. Locality records for specimens not collected by either Whitworth or Crake have been verified through correspondence with the late B. E. Bardwell of Broome or with other reliable collectors. Some of the records were furnished by Dr. Tom Richert and Mr. Clifton S. Weaver of Honolulu, who collected 29 species of *Cypraea* at Long Island in Exmouth Gulf while participating in the DAVINA EXPEDITION in 1960. Special thanks are also due to Dr. F. A. Schilder, who very kindly furnished his manuscript list of Western Australian cowrie species as well as his statis-

tics for a comparative study of *Cypraea caputserpentis reticulum* Gmelin, 1791 and *C. c. kenyonae* Schilder & Schilder, 1938, two races whose ranges apparently overlap to a certain extent along a part of Australia's west coast.

Although I originally intended to prepare only a checklist of cowrie species from the Exmouth Gulf area where most of our field work was done, I have more or less been obliged to extend the boundaries of the area studied in order to encompass the natural ranges of the various species; therefore the area covered here is from Cape Leeuwin in the south to Port Darwin in the north, the latter locality having been generally recognized as the northern limit of the Dampierian Region.

The actual presence of several species reported from Western Australia is yet unverified. Since this paper deals only with unquestionably reliable records, several given in the literature have been omitted intentionally, pending collection of additional material. They include such species as *Cypraea contaminata* Sowerby, 1832, *C. childreni* Gray, 1825, *C. gangranosa* Dillwyn, 1817, *C. maculifera* Schilder, 1932, *C. mauritiana regina* Gmelin, 1791, *C. felina* Gmelin, 1791, *C. microdon* Gray, 1828, *C. interrupta* Gray, 1824, *C. scurra* Gmelin, 1791, *C. punctata* Linnaeus, 1771, *C. thersites contraria* Iredale, 1935, and *C. (Umbilia) armeniaca* Verco, 1912.

For the most part, Western Australia is a lonely, virgin coastline with scores of islands, reefs, bays, and jutting headlands. The tides along these coasts vary greatly; along the south and southwest coasts diurnal tides predominate, the rise averaging two and a half feet or less — the least tides in all Australia. In the vicinity of the and northwest coasts the tides are mainly of the regular or semi-diurnal type, with a maximum range at Collier Bay of 36 feet — the largest tides in all Australia. These unusual tides unquestionably have some effect on the distribution of molluscan species, and may in part explain the large gap in occurrence of certain cowrie species that would normally be expected to have a continuous range from North West Cape northward, but it would be premature at this time to theorize on the reasons for some of the unexplained problems of this particular fauna. Far more study is needed before an accurate picture may be obtained; the present paper is only a first step toward this goal.

Since the long coastline of Western Australia remains largely uninhabited, many of its landmarks and localities are known only by local names not found on any maps. Therefore it became necessary to devise some method of locating many of the collecting stations mentioned; this has been accomplished through an index of the presently accepted place-names, arranged in alphabetical order, each followed by its latitude and longitude bearings.

Some of the more important of these have been indicated on the accompanying map.

Many of the listings of species in this paper extend the known range for those species considerably. Several represent potential new geographical races, one of which, a *nomen nudum*, has been given a new name. Another, because of its morphological differences and apparent geographical isolation from its nearest typical form, has been described as a new subspecies.

The largest and smallest shells of each species used in this study have been measured with a caliper to within one-tenth millimeter. It can probably be assumed that typical Western Australian examples of those species will vary in size somewhere between the two extremes given. Population densities are indeterminable at this time for some of the species, but perhaps some indication of relative abundance or scarcity may be gleaned from the number of specimens made available to me; this is mentioned under the discussion of each species.

#### ACKNOWLEDGMENTS

My thanks are extended to many people for their help. In addition to those already mentioned, I want to express my thanks to Mrs. Emily Reid for adapting a crude drawing into an excellent map; to Dr. Myra Keen for taxonomic advice; to Dr. Rudolf Stohler for translating source material and to Jean Cate whose extensive assistance in many ways made this work finally possible. It can well be said that this report would not have been completed without their combined interest and effort.

#### Index of Localities of West Australian *Cypraea*

This list is arranged alphabetically. In the subsequent discussion of the various species, reference is made to these localities by their order numbers only; moreover, the localities are listed there according to the relative abundance of the species, i.e., the locality where the species is most common is listed first.

	S. Lat.	E. Long.
1 Abrolhos Islands	28°31'	113°45'
2 Albany	34°57'	117°58'
3 Anson Bay	13°20'	130°08'
4 Barrow Island	20°41'	115°26'
5 Beagle Bay	16°55'	122°31'
5a Black rocks	24°32'	113°27'
6 Botany Bay	33°58'	151°13'
7 Broome	17°59'	122°14'
8 Buccaneer Archipelago	16°15'	123°15'
9 Bunbury	33°20'	115°37'
10 Busselton	33°39'	115°20'
11 Cable Beach	17°57'	122°12'30"
12 Cambridge Gulf	14°55'	128°15'
13 Cape Bossut	18°42'	121°37'
14 Cape Cuvier	24°13'30"	113°24'



	S. Lat.	E. Long.		S. Lat.	E. Long.
15 Cape Jaubert	19°02'	121°30'30"	58 Normanville	locality unknown	
16 Cape Leeuwin	34°22'	115°08'	59 North West Cape	21°47'	114°10'
17 Cape Leveque	16°24'	122°55'	60 Onslow	21°40'	115°07'
18 Cape Naturaliste	33°32'	115°00'	61 Old Onslow	21°43'	114°56'
19 Cape Vallaret	18°10'30"	122°10'30"	62 Peak Island	21°45'	114°25'
20 Carnac Island	32°07'	115°40'	63 Pelsart Island	28°30'	113°45'
21 Carnarvon	24°58'	113°40'	64 Point d'Entrecasteaux	34°51'	116°00'
22 Carpentaria Gulf	15°00'	138°00'	65 Point Maud	23°08'	113°46'
23 Cervantes Island	30°32'	115°03'	66 Point Murat	21°49'	114°11'
24 Clifton's Main Reef	33°31'05"	115°24'30"	66a Point Samson	20°36'	117°10'
25 Clifton's Reef, Outer Knob	33°31'05"	115°24'28"	67 Point Willunga	locality unknown	
25a Collier Bay	16°10'	124°15'	68 Port Darwin	12°28'	130°45'
26 Cottesloe Island	32°00'	115°46'	69 Port Essington	10°05'	132°30'
27 Daley Heads	locality unknown; see ALLAN, 1956		69a Port George IV	15°25'	124°04'
28 Dampier Archipelago	20°33'	116°35'	70 Port Hedland	20°20'	118°35'
29 Dampier Island (Reef)	25°24'	113°04'	71 Port Walcott	20°37'	117°10'
30 Depuch Island	20°38'	117°42'	72 Price's Point	17°47'	122°12'30"
31 Dirk Hartog Island	25°45'	113°00'	73 Quobba Point	24°30'	113°26'
32 Disaster Bay	16°55'	123°12'	74 Recherche Archipelago	34°00'	122°30'
33 Dunsborough	33°46'	115°05'	75 Riddell Point	18°00'	122°12'
34 Eagle Hawk Island	20°39'	116°27'	76 Robert Point (Mandurah)	32°32'	115°43'
35 Eighty Mile Beach	19°35'	121°00'	77 Roebuck Bay	18°05'	122°15'
36 Encounter Bay	35°38'	138°42'	78 Rottneest Island	32°00'	115°30'
37 Entrance Point	18°01'	122°13'	79 Rowley Shoals	17°10'40"	118°50'
38 Esperance	33°40'	121°58'		to 119°40'	
39 Eucla	31°40'	128°46'	80 Sandy Point	18°13'	122°11'
40 Exmouth Gulf	22°00'	114°15'	81 Shark Bay	25°30'	113°30'
41 Fort George	see Port George		82 Sorrento Reef	31°30'	115°30'
42 Fremantle	32°04'	115°45'		(approx.)	
43 Gantheaume Point	17°59'	122°11'	83 Spencer Gulf	33°55'	137°22'
44 Garden Island	32°12'	115°41'	84 St. Vincent Gulf	34°55'	138°10'
45 Geographe Bay	33°34'	115°10'	85 Stradbroke Island	27°35'	153°29'
46 Geraldton	28°47'	114°12'	86 Sunday Island	16°25'	123°11'
47 Gourdon Bay	18°26'	121°52'	87 Swan River	32°04'	115°45'
48 Houtman Rocks (Abrolhos)	28°31'	113°45'	87a Thevenard Island	21°27'	115°00'
49 King Sound	16°50'	123°25'	88 Torres Strait	10°00'	142°30'
50 Lagrange Bay	18°35'	121°42'	89 Troughton Island	13°04'	126°09'
51 Lancelin Island	30°59'	115°19'	89a Turtle Dove Shoal	29°04'	114°52'
52 Leighton Beach	31°58'	115°15'	90 Vlaming Head	21°48'	114°07'
53 Long Island	21°37'	114°40'	91 Walcott Inlet	16°22'	124°30'
54 Low Point	17°47'	122°12'	92 Wallaby Islands	28°27'	113°40'
55 Ludlow Beach	32°00'	115°45'	93 Ward Reef	21°32'	115°10'
56 Monte Bello Islands	20°25'	115°31'	94 York Sound	14°55'	125°07'
57 Nickol Bay	20°40'	116°55'			





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## CYPRAEIDAE

## Nariinae

*Pustularia* SWAINSON, 1840(*Pustularia* SWAINSON, 1840)1. *Pustularia* (*P.*) *cicercula cicercula* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 725

Localities 90, 59

WEAVER (1960): 53

	L	W	H	lip	col <sup>1</sup>
Largest shell:	19.0	13.3	12.0	26	22
Smallest shell:	16.2	11.6	10.5	28	24

Two shells were examined that were picked up in the beach drift in the immediate area below the Vlaming Head lighthouse. As far as I have been able to determine,

the WEAVER (1960) report represents the first mention of the species in Western Australia. IREDALE (1939) stated "I recorded *Pustularia cicercula* and *P. globulus* from Queensland, the latter only from Western Australia." ALLAN (1956) cited northern Australia.

The western shells seem to compare favorably with the morphology of the typical species. The dorsal pustulation and general appearance agree, although the shell is generally somewhat larger and more globular; the basal dentition extends deeply into the margins; the fossula is

<sup>1</sup> L = length of shell, in millimeters

W = width of shell, in millimeters

H = height of shell, in millimeters

lip = number of teeth on outer lip

col = number of teeth on columella, excluding terminal ridge

shallower and less concave though more heavily ribbed with teeth. Possibly the *Pustularia bistrinotata* SCHILDER & SCHILDER, 1937, reported by authors is a mistaken identification of this species.

2. *Pustularia (P.) globulus globulus* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 725

Localities 14, 73

IREDALE (1939), ALLAN (1956): Western Australia  
SCHILDER (1941): 7, 12, 79

	L	W	H	lip	col
Largest shell:	12.7	8.1	7.1	26	18
Smallest shell:	11.9	8.0	7.2	29	18

Two shells were examined, both collected after a storm, washed up with beach rubble. This species is rare in West Australian waters. The western shells are small for the species and compare favorably with those from the Seychelle Islands; the eastern *Pustularia globulus* attains nearly twice this size. An additional dead specimen was taken on the beach at Quobba Point. At present, nothing further is known about its distribution on the west coast of Australia.

*Staphylaea* JOUSSEAUME, 1884

(*Staphylaea* JOUSSEAUME, 1884)

3. *Staphylaea (S.) staphylaea* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 725

Localities 40, 59, 90, 77

COTTON (1950): 43 (B. E. Bardwell)

SCHILDER (1941): 88 (as *S. descripta* IREDALE, 1935)

ALLAN (1956): 43

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	17.9	10.7	8.8	21	22
Smallest shell:	13.2	8.1	6.9	20	18

Five shells were examined. The Dampierian shells seem to be generally smaller though apparently typical of the species. The aperture is narrower than that of *Staphylaea staphylaea descripta* and the shell more compact in form.

4. *Staphylaea (S.) limacina facifer* (IREDALE, 1935)

Austral. Zool., 8 (2): 119; plt. 8, fig. 6

Localities 40, 48, 90, 59, 7

SCHILDER (1941): 88

	L	W	H	lip	col
Largest shell:	18.2	10.3	8.2	19	15
Smallest shell:	13.6	8.2	6.8	20	18

Three shells were examined. The species is fairly common; the center of distribution for this subspecies appears

to be from the southern shore of Exmouth Gulf to Vlaming Head, an extreme extension of range for the subspecies which is apparently living in this area as an isolated geographical group. The shells are conspicuous because of their smaller size in comparison with the other races.

(*Nuclearia* JOUSSEAUME, 1884)

5. *Staphylaea (N.) nucleus nucleus* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 724

Localities 40, 93

WEAVER (1960): 53

	L	W	H	lip	col
Shell measurements:	22.7	14.0	11.2	21	19

One shell was examined. So far as it is now known the species is rare. A single dead bleached and beach-worn specimen was collected at Point Murat in Exmouth Gulf. Although subfossil, the shell is sufficiently well preserved to exhibit the species' typical morphological characters, including the yellow-buff color above the terminal openings. The shell appears more bulbously inflated than any of the other subspecies studied; the teeth are fewer, and considerably shorter on the base as well. This is an extreme extension of range for the species, which was apparently first recorded from Western Australia by WEAVER (1960), from beach drift at nearby Long Island. Whitworth has also reported a third dead specimen collected at Ward Reef.

*Erosaria* TROSCHER, 1863

(*Ravitronea* IREDALE, 1930)

6. *Erosaria (R.) labrolineata labrolineata*  
(GASKOIN, 1849)

Proc. Zool. Soc. London for 1848: 97

(13 March, 1849)

Localities 90, 59, 40

	L	W	H	lip	col
Largest shell:	19.8	11.6	9.8	18	17
Smallest shell:	15.0	9.0	7.6	16	11

Five shells were examined, two from Vlaming Head and three from Exmouth Gulf. Although it would constitute a long range extension, I have grouped these shells with those of the nominate subspecies after comparing them with *Erosaria labrolineata nashi* IREDALE, 1931. The Dampierian shells are narrower; the lateral edge of the right margin is more sharply angled yet less pronounced; the teeth are finer, particularly on the base and do not cross the fossula as they do in the *E. l. nashi* of eastern Australia; the lateral spots are also more numerous.



7. *Erosaria* (R.) *cernica viridicolor* (CATE, 1962)

The Veliger 4 (4): 175; plt. 40, figs. 1-9

Localities 73, 90, 59, 40, 62, 42, 5a, 87a, 89a

	L	W	H	lip	col
Largest shell:	28.2	18.5	13.8	20	17
Smallest shell:	16.0	10.0	8.1	16	15

Forty-one shells were examined. The subspecies appears to be common at only one station, as far as we have been able to determine; this is just below the lighthouse at Vlaming Head, which is the type locality. Shells were also collected in Exmouth Gulf, to Point Murat. It has been collected by Barry Wilson in 70 feet of water, under stones, off Peak Island. A dead specimen was found on the beach near Fremantle, also by Mr. Wilson (personal communication).

8. *Erosaria* (R.) *helvola citrinicolor* IREDALE, 1935

Austral. Zool., 8 (2): 116

Localities 40, 90, 59, 18, 46, 31, 49, 7

HEDLEY (1915) *ex* BRAZIER, 1882: 79

IREDALE (1939): 31, 81

SCHILDER (1941): 45, 42, 87, 81, 46, 21, 68

STEADMAN &amp; COTTON (1946): Northwest Australia

ALLAN (1956): Western Australia

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	22.0	14.9	10.3	18	12
Smallest shell:	16.9	11.0	8.9	17	13

Twenty-eight shells were examined. Although this subspecies is widely distributed along the western coast, it cannot be classed as common. Exmouth Gulf proved to be the most productive among the localities cited above. Six shells were collected at Broome, Roebuck Bay over a two-month period; none have been seen since that time. BRAZIER (1882) erroneously referred to this form from Rowley Shoals as *Cypraea citrina* GRAY, 1824, confusing it with the distinct east African species. According to ALLAN (1956), COTTON has examined series of these shells from Cottesloe and Rottnest Island which he considered typical of *Erosaria helvola helvola* (LINNAEUS, 1758). A specimen from Leighton, however, was considered by him to be typical of IREDALE's subspecies.

9. *Erosaria* (R.) *caputserpentis reticulum* (GMELIN, 1791)

Syst. Nat., Ed. 13, p. 3407

Localities 90, 59, 40, 73, 7, 43, 11, 5, 17

KENYON (1898), IREDALE (1935), and ALLAN (1956): Western Australia

IREDALE (1914): 56

HEDLEY (1915): 44 (*ex* MENKE, 1843); 46 (*ex* VERCO, 1914)

SCHILDER (1941): 7, 12, 79

COTTON (1950): 40

	L	W	H	lip	col
Largest shell:	34.2	25.0	17.6	18	12
Smallest shell:	31.2	22.4	15.7	15	11

Seventy-two shells were examined. This common species ranges generally from south of Cape Naturaliste to Cape Leveque. It seems to possess interesting morphological differences at opposite ends of its range; certain physical aspects become sufficiently altered to divide the species into two distinct allopatric races. The area of Exmouth Gulf to Shark Bay seems to be the middle ground where examples of both forms may be found mingling and living together as individuals, yet at the same time intergrading variants are also present. The two subspecies involved are *Erosaria caputserpentis reticulum* (GMELIN) and *E. c. kenyonae* SCHILDER & SCHILDER, 1938. Dr. Schilder has very kindly given me permission to quote from his reply to a letter of mine: "Since 1938 I have examined far more specimens which alter our views in some respects: *kenyonae* is a race which exhibits no geographical exact limits separating its populations from those of *caputserpentis* (*reticulum*) but it is a so called "cline": the populations gradually pass from pure *caputserpentis* in the tropics to pure *kenyonae*, which seems restricted to southwest Australia, between Abrolhos Archipelago to Pallinup and C. Entrecasteaux on the south coast. In northwest Australia from Broome to Shark Bay the populations exhibit an increasing number of extreme shells which agree in all characters with the true *kenyonae*, while true *caputserpentis* become gradually less frequent, mostly replaced by intermediates in one or the other respect. One cannot say that the two "races" are living together, as there is one population with a range of variation from *caputserpentis* to *kenyonae*, so that it may be called intermediate. These intermediate populations show increasing influence of the warm *caputserpentis* and the cold *kenyonae*, according to its habitat further north or south. On the east coast of Australia from Torres Strait to Sydney there is a similar passing of *C. caputserpentis argentata* DAUTZENBERG - BOUGE, 1933 into *C. caputserpentis caputanguis* PHILIPPI, 1849."

The base of these shells is relatively flat; the terminals are greyish-blue, the base a pastel variation of yellow-orange, beige and white; the teeth are finer, more delicate, and are white; the interstices and more of the base are white as well.

10. *Erosaria* (R.) *caputserpentis kenyonae* SCHILDER & SCHILDER, 1938

Proc. Malac. Soc. London, 23 (3): 136;

*ibid.* 3: 77, fig. 2

Localities 40, 90, 59, 73, 7

COTTON (1950): 52, 26, 78

ALLAN (1956): Western Australia

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	41.8	29.7	22.1	19	14
Smallest shell:	22.3	14.9	12.0	15	12

Twenty-eight shells were examined. This common subspecies merges with *Erosaria caputserpentis reticulum* (GMELIN, 1791) in Roebuck Bay, becoming increasingly isolated southward from Quobba Point to Cape Naturaliste (see preceding subspecies, *E. c. reticulum*).

This subspecies may easily be identified by its more swollen base; the teeth are white and much larger and heavier; most of the base, the interstices, and the terminals are brown. As a standard for separating these shells from *Erosaria caputserpentis reticulum*, it may be said that any trace of brown in the interstices would align the shell with *E. c. kenyonae*.

(*Erosaria* TROSCHEL, 1863)

11. *Erosaria* (E.) *poraria poraria* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 724

Localities 40, 90, 59

SCHILDER & SCHILDER (1938 - 39): Northwest Australia.

	L	W	H	lip	col
Largest shell:	18.6	12.1	9.5	21	15
Smallest shell:	14.2	8.8	7.1	18	12

Five shells were examined. This species is rather uncommon and, as far as we have been able to determine, is not plentiful anywhere along the west coast. KENYON (1879) published the new name *Cypraea wilhelmina* for a small pallid shell that both IREDALE (1939) and ALLAN (1956) suspect is a dead specimen approaching *Erosaria poraria*. Bernard C. Cotton (personal communication) says his conclusion agrees with that of IREDALE in which *E. wilhelmina* is a pale variant of *E. poraria*. The holotype of the Kenyon species is in the South Australian Museum, No. D 14447. Mrs. Kenyon stated that she had four other specimens very similar to the type. The shells from the North West Cape and Exmouth Gulf seem to be generally smaller than the northern and far western races, although there is an occasional large specimen. The dorsum is a deep, lustrous brownish-yellow flecked with a thick concentration of white spots, some of which appear to be ocellated with a darker brown ring. The margins are thickened, the right one being pitted. The base and margins are a deep, rich, intense lavender color, the teeth and interstices are white.

12. *Erosaria* (E.) *erosa purissima* (VREDENBURG, 1919)

Journ. Asiat. Soc. Bengal, 15: 143

Localities 7, 37 to 11, 40

IREDALE (1914): 56

HEDLEY (1915): 56 (ex IREDALE, 1914)

IREDALE (1935): 40, 71, 29

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	46.9	27.5	20.0	20	15
Smallest shell:	36.8	22.2	16.7	17	14

Twelve shells were examined. The species is fairly common. Although this species seems to be living in a restricted geographical area, it compares very favorably with the eastern Australian shells and is considered conspecific, pending further study. *Erosaria erosa phagedaina* (MELVILL, 1888), of Cocos Island, should also be compared with these, as it also closely resembles the Dampierian form.

13. *Erosaria* (E.) *miliaris diversa* (KENYON, 1902)

Journ. Conch. 10: 184

Localities 40, 7, 11

KENYON (1902): Shark Bay, West Australia

	L	W	H	lip	col
Largest shell:	40.8	25.2	20.4	22	16
Smallest shell:	33.5	23.2	17.6	19	15

Seven shells were examined. The subspecies is most common at Broome and Cable Beach; the specimens listed above were both from the latter beach. IREDALE (1935) gave the name *Erosaria metavona* to the Queensland race of *E. miliaris*. Later (1939), he examined a specimen from Shark Bay and compared it with *E. metavona* but agreed it was more pinched anteriorly and more elevated than that species. He further mentioned that the Kenyon type was a dead shell and its coloration indistinguishable. It is not clear why IREDALE questioned the species. Aside from the characteristic features of the shell, Mrs. Kenyon evidently was aware of what species she was working with, for she concluded her discussion with "I think the discovery of this variety (Shark Bay, West Australia) proves the complete separation of the two species *C. eburnea* and *C. miliaris*." Further, it is difficult to understand why SCHILDER & SCHILDER (1938 - 39, 1941) used, for an east Australian race whose range is from northeast Australia to Port Moresby, the name Kenyon proposed for these Dampierian shells.

The Exmouth Gulf shells are of a fairly large size, a yellow-buff dorsal coloring, thickly covered with small white spots of various sizes; both thickened upswept margins are pitted and arc white, as are the base, teeth, and



interstices. The teeth are sharply pointed on the lip. A grey mantle line traverses the upper right dorsum.

*Monetaria* TROSCHER, 1863

(*Ornamentaria* SCHILDER & SCHILDER, 1936)

14. *Monetaria* (*O.*) *annulus annulus* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 723

Localities 7, 11

HEDLEY (1915) (*ex* MENKE, 1843) IREDALE  
(1935): Western Australia

SCHILDER (1941): 7, 12, 79

ALLAN (1956): Dampierian Region

	L	W	H	lip	col
Largest shell:	25.0	16.8	12.0	13	9
Smallest shell:	21.9	15.7	10.8	13	11

Four shells were examined. It is a common species, known to range from Quobba Point to Cape Leveque, intertidally.

(*Monetaria* TROSCHER, 1863)

15. *Monetaria* (*M.*) *moneta rhomboides*

SCHILDER & SCHILDER, 1933

Zool. Meded. Leiden, 16: 163

Localities 40, 90, 59, 7, 43

HEDLEY (1915) (*ex* MENKE, 1843): West Australia

IREDALE (1914): 56

SCHILDER (1941): 40, 71, 29

ALLAN (1956): Dampierian Region

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	44.2	32.0	22.9	13	11
Smallest shell:	18.8	11.7	9.0	12	13

Eight shells were examined. This species is fairly common from Quobba Point to Cape Leveque. There is considerable variation in size. The color ranges from a pale yellow-grey-green almost to a deep yellow-orange. A large percentage of specimens shows a fine, bright orange dorsal ring. However, it is not, because of this, to be confused with *Monetaria annulus* (LINNAEUS, 1758), as it in no way otherwise approaches the appearance of this latter species.

*Erronea* TROSCHER, 1863

(*Adusta* JOUSSEAUME, 1884)

16. *Erronea* (*A.*) *subviridis dorsalis*

SCHILDER & SCHILDER, 1938

Proc. Malac. Soc. London, 23 (3): 149

Localities 40, 90, 59, 48, 7, 11, 50, 13

HEDLEY (1915) (*ex* BRAZIER, 1879): 57, 30

IREDALE (1939): Western Australia

SCHILDER (1941): 7, 12, 79, 40, 71, 68, 69, 22

ALLAN (1956): Western Australia, 7, Northern Australia

	L	W	H	lip	col
Largest shell:	36.0	22.0	17.2	19	18
Smallest shell:	22.2	13.0	10.6	19	15

Forty-two shells were examined. The species is common at all stations. IREDALE (1935) compares this Western Australian form to *Cypraea viridis* REEVE, 1835, which was described without locality. STEADMAN & COTTON (1946) did not recognize *Erronea subviridis dorsalis*, preferring to list it as *E. subviridis subviridis* (REEVE, 1835). ALLAN (1956), having seen many of the western shells, agrees with the Schilderian name. The finely punctate dorsum with its large central chestnut blotch separates this subspecies from the other two races characterized by interrupted grey dorsal zones. The Lagrange Bay shell was collected on the beach 12 miles south of Cape Bossut. The Abrolhos specimen was taken in a craypot, in from five to six fathoms, at North Island. All the shells examined in this study were collected between there and Cable Beach. This species seems equally adaptable to both intertidal and deep water habitats, down to at least 10 fathoms.

17. *Erronea* (*A.*) *pyriformis smithi* (SOWERBY, 1881)

Proc. Zool. Soc. London for 1881: 638

Localities 17, 32, 49, 59, 5

IREDALE (1935): West Australia

SCHILDER (1941): 7, 12, 79, 68, 69, 22

STEADMAN & COTTON (1946): North West Australia

ALLAN (1956): 50

	L	W	H	lip	col
Largest shell:	28.6	16.7	14.1	17	21
Smallest shell:	17.3	12.0	9.8	18	15

Seven shells were examined. The species is uncommon. The general appearance of these shells — which are noticeably small for the species — is short, wide, and abruptly pyriform; lacking on many of the shells, especially on those from Disaster Bay, is the characteristic brown interrupted dorsal color banding. The brown coloring of the teeth is usually paler, also. In so far as this short series of shells shows, it would seem that SOWERBY's *Erronea pyriformis smithi* is reasonably easily separable from the east Australian race, *E. pyriformis pyriformis* (GRAY, 1824) morphologically and geographically.

18. *Erronea* (*A.*) *walkeri continens* (IREDALE, 1935)

Austral. Zool., 8 (2): 127

Localities 7, 37, 43 to 11

SCHILDER (1941): 22, 88

STEADMAN & COTTON (1946): 69

ALLAN (1956): 69

	L	W	H	lip	col
Largest shell:	26.1	14.8	12.4	22	21
Smallest shell:	21.0	12.2	10.0	19	17

Nine shells were examined. This species is scarce although not rare in Western Australia. At Broome these mollusks were found moving across exposed, bare sand flats more than a half mile from the nearest cover. They seem to be essentially sand-dwelling cowries, not found on rocks. They are apt to occur on a muddy, sandy substrate where a sparse weed growth is present, taking cover in and under pieces of dead shell and old iron. (*Erronea subviridis dorsalis* SCHILDER & SCHILDER, 1938 is another species found out in the open in the same way.) A pair of *E. walkeri continens* was observed sharing the same half-valve of a discarded oyster shell.

(*Erronea* TROSCHEL, 1863)

19. *Erronea (E.) ovum ovum* (GMELIN, 1791)

Syst. Nat., Ed. 13, p. 3412

Locality 4

SCHILDER (1941): 7, 12, 79

	L	W	H	lip	col
Largest shell:	25.3	15.0	12.6	15	15
Smallest shell:	19.4	11.6	9.6	13	13

Four shells were examined. These specimens are from the B. E. Bardwell (Broome) Collection, and are said to have been collected by pearl luggers about 1922. We know of no recent occurrence of this species in Western Australia, and it therefore must be considered a rare species there. The dorsal coloring in these shells appears to be a much lighter greyish-green than is normally observed in the eastern races.

WEAVER (1960) reported collecting "*Cypraea ovum*" from Long Island at the north end of Exmouth Gulf, but these shells have subsequently been identified as *Ovula ovum* (LINNAEUS, 1758) (personal communication).

20. *Erronea (E.) erronea coxi* (BRAZIER, 1872)

Proc. Zool. Soc. London, 1872: 617

Localities 40, 90, 59, 7, 11, 68, 17

HEDLEY (1915) (*ex* MENKE, 1843), IREDALE (1939), STEADMAN & COTTON (1946):  
Western Australia

SCHILDER (1941): 40 (*E. coxi*), 71, 28

ALLAN (1956): Dampierian Region, 7, Western Australia

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	35.0	19.7	15.9	18	14
Smallest shell:	29.0	16.6	13.8	15	16

Eighteen shells were examined. This is a common species in northwestern Australia. It has been the subject of some taxonomic controversy; IREDALE (1939) raised this subspecies to full specific rank, giving it the name *Erronea magerrones magerrones* and established the Dampierian form as a race, *E. magerrones proba*. They are doubtfully distinct from *E. erronea erronea* (LINNAEUS, 1758). The western form *E. e. coxi* is a good geographical race. The type locality is Broome.

21. *Erronea (E.) cylindrica sowerbyana* SCHILDER, 1932

Foss. Cat., Cypraeaacea: 192

Localities 40, 90, 59, 60, 7, 43, 11, 68, 17

HEDLEY (1915): 79 (*ex* BRAZIER, 1882)

IREDALE (1935), STEADMAN & COTTON (1946):  
North West Australia

SCHILDER (1941): 7, 12, 79, 40, 71, 28

WEAVER (1960): 53

ALLAN (1956): Western Australia

	L	W	H	lip	col
Largest shell:	32.8	16.7	13.9	22	23
Smallest shell:	25.0	12.9	10.8	17	18

Twenty-seven shells were examined. It is a common form at most localities. The measurements above were taken from Roebuck Bay shells; Exmouth Gulf specimens seem to average smaller.

22. *Erronea (E.) caurica blaesa* IREDALE, 1939

Austral. Zool., 9 (3): 322

Localities 40, 90, 59, 7, 11, 73, 17

HEDLEY (1915) (*ex* MENKE, 1843): West Australia

IREDALE (1935, 1939): West Australia;  
(1914): 48

SCHILDER (1941): 40, 71, 28

STEADMAN & COTTON (1946): Northwest Australia

ALLAN (1956): 7, West Australia

	L	W	H	lip	col
Largest shell:	46.0	25.9	20.8	20	19
Smallest shell:	36.6	20.4	16.3	16	14

Twenty-six shells were examined. This subspecies seems to be more common in that part of its range from Quobba Point to Exmouth Gulf. A collector in Broome, the type locality, reports, "you find the odd one of these alive, far more are dead on the beaches than anywhere else." The western shells are generally large for the species, and apparently of only moderately common occurrence throughout its known range, Quobba Point to Cape Leveque.



(*Guttacypraea* IREDALE, 1935)

*Notocypraea* SCHILDER, 1927

23. *Notocypraea* (G.) *pulicaria* (REEVE, 1846)

Conch. Icon., vol. 3, *Cypraea*, fig. 84

Localities 18, 10, 45, Southwest Australia

HEDLEY (1915) (*ex* HIDALGO, 1907): 45

IREDALE (1935): West Australia

SCHILDER (1941): 45, 42, 87

STEADMAN & COTTON (1946): Western Australia

ALLAN (1956): Western Australia, 52

	L	W	H	lip	col
Largest shell:	21.0	11.6	9.0	28	27
Smallest shell:	16.2	9.5	7.4	22	21

Twelve shells were examined. This species is uncommon to rare, and although occasionally collected intertidally, it is more commonly dredged from deeper water. The range seems to extend southward from the area of Swan River in the west to Eucla in South Australia.

*Palmadusta* IREDALE, 1930

(*Palmadusta* IREDALE, 1930)

24. *Palmadusta* (P.) *asellus asellus* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 722

Localities 40, 90, 59, 65, 61, 7

COTTON (1950): North West Australia (B. E. Bardwell, Broome)

ALLAN (1956): repeats COTTON, 1950

	L	W	H	lip	col
Largest shell:	18.3	11.1	8.5	19	13
Smallest shell:	17.0	10.5	8.5	16	15

Three shells were examined, one subadult. Two were collected at Broome, the third off Old Onslow Beach. Specimens from the other localities listed are in the Whitworth Collection or have, from time to time, been observed in subfossil form in beachdrift. The three above mentioned shells were all collected by Mr. Bardwell. One was received directly from him, the other two from the collection of R. Sharon, Redondo Beach, California. There seems little doubt the species is rare and obviously needs further investigation.

25. *Palmadusta* (P.) *clandestina clandestina*

(LINNAEUS, 1767)

Syst. Nat., Ed. 12, p. 1177

Localities 90, 59, 40, 77, 49, 17

ALLAN (1956): 7

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	23.0	13.7	11.0	21	16
Smallest shell:	14.8	9.6	7.7	18	15

Twenty-one shells were examined. The species is common and ranges from Quobba Point to Cape Leveque. Some authors place this group with the subspecies *Palmadusta clandestina moniliaris* (LAMARCK, 1810); however, it seems to be more closely allied with the nominate subspecies from Ceylon. The Exmouth Gulf shells are often large in size, comparing favorably with the east African *P. clandestina passerina* (MELVILL, 1888) in this respect.

26. *Palmadusta* (P.) *saulae saulae* (GASKOIN, 1843)

Proc. Zool. Soc. London for 1843: 23

Locality 7

	L	W	H	lip	col
Shell measurements:	26.0	15.2	11.7	22	17

One shell examined; very rare.

This specimen was collected alive by Mr. Ted Crake, Broome, and is possibly the first example of this species reported from Western Australia. Because it is apparently a unique specimen with an unusual locality record, it seems to deserve special mention here. It differs somewhat in outward appearance from *Palmadusta saulae saulae* (GASKOIN) from the Philippines, and even its most closely related race, *P. saulae nugata* IREDALE, 1935, is markedly different.

The Dampierian shell is large and broad, narrowing quickly abapically. At best it seems to relate more favorably with the northern (GASKOIN) race (L 26.8; W 14.9; H 12.3; lip 20; col. 17; Cate Coll. 1048; see CATE, 1960). It is bulbously ovate, umbilicate; teeth are short, well defined on the outer lip, intermittently so on the columella but extending across the fossula. The front and rear terminals are noticeably rostrate; the right margin is thick, the left side is uncalled and curves smoothly from dorsum to base; the primary shell color is pearl-grey, with a very large central brown dorsal blotch that covers at least 20 per cent of the upper surface; the remaining area is thickly sprinkled with minute brown dots, the margins are copiously flecked with larger brown spots, and in addition there is a brown spire blotch. For the most part the base is devoid of spots, is of a lighter basic grey color, as are the teeth. The terminal openings, columella, fossula, and interstices are bright orange-yellow. The animal's foot and mantle are brilliant orange, marked with fawn-colored spots.

The animal was collected in mid-December 1962 and was found high up in a very small tide pool filled with about four feet of water during a neap tide. Mr. Crake relates, "There was one rock I could turn in the pool, and it was quite small. Underneath was a beautiful *Cypraea fallax* and right along side was the *C. saulae*, both with mantles up."

27. *Palmadusta (P.) lutea bizonata* IREDALE, 1935

Austral. Zool., 8 (2): 126

*Cypraea lutea* GMELIN, 1791

Syst. Nat., Ed. 13, p. 3414

(non *C. lutea* GRONOVIVUS, 1781 of authors[non binominal])

Zoophyl. Gronoviani, 3: 287, pl. 19, fig. 17

Localities 90, 59, 40, 43, 17, 7

HEDLEY (1915): 57 (ex BRAZIER, 1872)

IREDALE (1935): North West Australia (57)

SCHILDER (1941): 81, 21, 46, 40, 71, 28

	L	W	H	lip	col
Largest shell:	17.5	10.1	8.3	19	17
Smallest shell:	15.5	9.7	8.3	17	17

Three shells were examined. The species is uncommon. The report from Broome is that only an occasional shell is ever found, which is true for the other stations as well.

28. *Palmadusta (P.) ziczac ziczac* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 722

Localities: 90, 59, 66

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	19.0	10.5	8.3	19	20
Smallest shell:	13.8	9.0	7.1	18	16

Nine shells were examined. The species is uncommon. All shells were collected dead in the beach drift. Though beach-rolled, the shell color and markings were well preserved. The Vlaming Head shells appear to be narrower, somewhat longer than the shells of the other races, and to have a narrower, straighter ventral aperture.

*(Melicerona IREDALE, 1930)*29. *Palmadusta (M.) gracilis hilda* (IREDALE, 1939)

Austral. Zool., 9 (3): 312

Localities 21, 40, 7

SCHILDER (1941): 81, 46, 21, 68, 69, 22

STEADMAN &amp; COTTON (1946): 81

COTTON (1950): 77 (B. E. Bardwell)

ALLAN (1956): 81, 77

	L	W	H	lip	col
Largest shell:	16.4	10.4	8.3	17	13
Smallest shell:	14.0	9.7	7.6	13	14

Twenty-three shells were examined. At Broome, only an occasional living specimen is collected; however, many dead shells can be picked up on the beach in the proximity of Lighthouse Point. The species is fairly common and ranges from Shark Bay to Cape Leveque. SCHILDER & SCHILDER (1938-39) taxonomically combined these west-

ern shells with the southeast Australian (Botany Bay) *Palmadusta gracilis macula* (ANGAS, 1867) but did not speculate that they might be racially distinct. IREDALE (1939) separated them but elevated *P. macula* to full specific status, considering this Dampierian form new to science. Believing that *P. macula* did not belong in the subgenus *Melicerona* IREDALE, 1930, he established a new subgenus, *Cupinota*, with *P. macula* as its type. After comparing series of *P. macula* with similar series of *P. gracilis gracilis* (GASKOIN, 1849) I consider it unnecessary to make this taxonomic change; therefore I have retained the combination *Palmadusta (Melicerona) gracilis hilda* (IREDALE, 1939), the type locality of which is Shark Bay.

30. *Palmadusta (M.) fimbriata fimbriata* (GMELIN, 1791)

Syst. Nat., Ed. 13, p. 3420

Localities 90, 59, 40, 57, 5

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	11.4	6.6	5.2	15	16
Smallest shell:	10.8	6.5	5.1	16	16

Three shells were examined. The species is uncommon. The shells studied were collected approximately midway between Vlaming Head and Point Murat. Other specimens are known to have been collected deeper in the recesses of Exmouth Gulf. Shells from Nickol Bay and Beagle Bay are in the Whitworth Collection (Geraldton).

31. *Palmadusta (M.) hammondae* (IREDALE, 1939)

Austral. Zool., 9 (3): 312; plt. 28, figs. 19-22

Localities 75, 7

STEADMAN &amp; COTTON (1946): Clarence River, N. S. W.

IREDALE (1939): Yirrkala, Northern Territory; Woolgoola, N. S. W.

ALLAN (1956): Type locality, Clarence River Heads, N. S. W.

	L	W	H	lip	col
Largest shell:	16.6	9.6	8.0	16	16
Smallest shell:	14.0	7.7	6.2	16	15

Five shells were examined, four from Broome, Roebuck Bay and one from Stradbroke Island, Moreton Bay, south-eastern Queensland. This is a relatively new species, closely related to the *Palmadusta fimbriata* complex of allopatric races, having, among other similar characteristics, the pale lavender terminals common to this group. As far as we know at the present time the species is uncommon and apparently occupies an unusually wide range. The type locality is given as Clarence River Heads, Northern New South Wales.



(*Blasicrura* IREDALE, 1930)

32. *Blasicrura* (B.) *quadrifasciata thielei*

SCHILDER & SCHILDER, 1938

Proc. Malac. Soc. London, 23 (3): 164

Localities 43, 86, 7, 17, 72, 89

SCHILDER (1941): 7, 12, 79

COTTON (1950): 77 (B. E. Bardwell, Broome)

ALLAN (1956): 7

	L	W	H	lip	col
Largest shell:	23.0	13.0	11.2	17	17
Smallest shell:	18.8	10.9	8.9	18	15

Ten shells were examined, eight from Sunday Island, King Sound and two from Gantheaume Point, Roebuck Bay. The northern shells are larger and more greenish. The Gantheaume Point shells are both about equal in size, smaller than the others and with paler greyish dorsal color. The species is not common, apparently not ranging much farther south than Broome; it occurs more frequently from Price's Point to Troughton Island in the north.

33. *Blasicrura* (B.) *pallidula simulans*

SCHILDER & SCHILDER, 1940

Arch. Molluskenkunde 72: 42

Localities 90, 59, 37, 7, 73, 73 to 7

SCHILDER (1941): 46, 81, 21

ALLAN (1956): Western Australia (= *fluctuans*)

IREDALE, 1935)

	L	W	H	lip	col
Largest shell:	20.9	11.2	9.1	22	17
Smallest shell:	16.4	9.2	7.2	19	17

Eleven shells were examined. Fairly common, though SCHILDER & SCHILDER (1952) recorded these shells as rare. I have compared specimens with the form *Blasicrura pallidula rhinoceros* (SOUEBIE, 1865) from Gubbins Reef, Cooktown, northern Queensland, and they display a reasonably pronounced morphic variation, having the terminals more produced, longer and more distinct teeth, a more pyriform shape and distinctly interrupted dorsal color bands. The western shells seem also to average larger in size. "*Blasicrura interrupta* (GRAY, 1824)" of authors for this locality probably refers to subadult examples of *B. pallidula*, as no evidence has yet been found to suggest the presence in this region of *B. interrupta*. While this species is also found on rocks at low tide, it seems to show some preference for sheltered tide pools higher up inshore.

(*Derstolida* IREDALE, 1935)

34. *Blasicrura* (D.) *hirundo cameroni* IREDALE, 1939

Austral. Zool., 9 (3): 314; plt. 28, figs. 29 - 31

Localities 90, 59, 40, 7

IREDALE (1939): 81, Yirrkala, Northern Territory

SCHILDER (1941): North West Australia

STEADMAN & COTTON (1946): North Australia

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	20.4	14.0	10.8	21	17
Smallest shell:	12.4	7.6	6.1	18	14

Seventeen shells were examined. The species is common at Vlaming Head and Exmouth Gulf, but a report from Broome (Crake) says the shells are not common there, "just the odd shell now and then." These grey-topped shells may possess a small central blotch. Two white lines cross the blue-grey dorsum transversely, the anterior one looking roughly like the numeral 2 lying on its side, whereas the adapical line is straight. This pattern appears to be constant for the species. There are prominent brown blotches on either side of the front and rear terminals, with finer brown spotting along the margins. Otherwise the terminals, margins, base, teeth, and interstices are white. There is an interesting variation in the columellar dentition: on nearly half of the specimens the columellar teeth are very short, becoming obsolete on the front half of the base, while on the others the central teeth are long -- nearly reaching the marginal edge -- and well defined the full length of the base. In each case the teeth are strong on the fossula. In this race of *Blasicrura hirundo* (LINNAEUS, 1758), the shells are larger and bulbously broader; the dorsal markings also are correspondingly larger and more prominent.

Working with these shells from both Exmouth Gulf and Broome, I have observed what appears to be a distinct dimensional separation in the species. The larger shells (20.4, 14.0, 10.8, 21, 20) and the smaller shells (14.8, 9.0, 7.1, 18, 17) are found living together even though they seem to possess rather uniform shell and color characteristics. Even so, the dwarf specimens seem to approach more closely *C. hirundo neglecta* SOWERBY, 1837, while the larger ones are unquestionably the *C. hirundo cameroni* of IREDALE.

35. *Blasicrura* (D.) *ursellus ursellus* (GMELIN, 1791)

Syst. Nat., Ed. 13, p. 3411

Locality 7

	L	W	H	lip	col
Largest shell:	13.0	8.2	6.5	18	18
Smallest shell:	9.2	5.7	4.6	17	17

Seven shells were examined, all of which were collected at Broome (ex Colls. Bardwell - 1; V. M. Baker - 1; C. N. Cate - 5). All were dead beach specimens though in excellent condition. The occurrence of this species at this locality is rare, and it is not known in our experience from elsewhere in northwest Australia. IREDALE (1939) appears to have confused this species with *Blasicrura hirundo* (LINNAEUS, 1758) *Blasicrura ursellus* is unquestionably a distinct species that can very easily be separated by a

distinctive lavender-grey dorsal pattern characteristic of and constant in all examples, and by the unusual way the columellar and labral teeth merge in the vicinity of the adapical terminal collar; neither *B. hirundo* nor *B. kieneri* have this unusual arrangement of teeth. In *Blasicrura ursellus* the shells are usually smaller and more pyriform, never displaying the brown dorsal blotch common to the other species.

36. *Blasicrura* (*D.*) *stolida stolida* (LINNAEUS, 1758)

Syst. Nat., Ed. 10: 724

Localities 90, 59

COTTON (1950): 7 (*leg.* R. W. Tymms, list B. E. Bardwell)

ALLAN (1956): 7, 77

	L	W	H	lip	col
Largest shell:	28.4	16.1	13.1	23	20
Smallest shell:	27.0	15.6	12.7	22	19

Two shells were examined. This is an uncommon species, apparently isolated in West Australia from Vlaming Head to Broome. Curiously, it shares a part of its range with *Blasicrura stolida brevidentata* (SOWERBY, 1870). On available evidence there does not appear to be any hybridization between the two subspecies. Our knowledge of this form in West Australia is limited to the single locality given, with this field note, "Found two *C. stolida stolida*, one in fair shape, the other has lost some dorsal colouring, but is otherwise intact. Only know of two other specimens found at North West Cape Light, one by each of the light-keepers' wives."

37. *Blasicrura* (*D.*) *stolida brevidentata* (SOWERBY, 1870)

Thes. Conch., 4 (30): 11; plt. 30, figs. 325 - 326

Localities 66a, 19, 7, 11, 77

HEDLEY (1915): 18 (*ex* COX, 1900 = *irvinae*)

SCHILDER (1941): 7, 12, 11, 77, 79

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	24.8	15.0	11.5	15	13
Smallest shell:	20.4	12.3	10.3	16	12

Ten shells were examined. This race is fairly common. The two shells whose measurements are listed above were collected at Broome, Roebuck Bay. COTTON (1950) and ALLAN (1956) recognize *Blasicrura stolida stolida* (LINNAEUS) from northwest Australia, but with IREDALE (1939) seem not to know of this subspecies living there as well. One wonders if in fact they were not referring to the SOWERBY subspecies, since the Linnaean one has only recently been found in Western Australia. The type locality of *B. s. brevidentata* is Broome. I have specimens from Thursday Island, Torres Strait, that apparently link the former with Western Australia. The two races are easy to separate through differences in general color patterns, shape of shell, and character of base teeth.

*Cribraria* JOUSSEAUME, 1884

(*Talostolida* IREDALE, 1931)

38. *Cribraria* (*T.*) *teres teres* (GMELIN, 1791)

Syst. Nat., Ed. 13, p. 3405

syn.: *Cypraea tabescens* DILLWYN, 1817

Localities 90, 59, 40

IREDALE (1935): West Australia (HEDLEY, THIELE)

SCHILDER (1941): North West Australia

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	33.5	19.1	15.7	25	27
Smallest shell:	21.2	12.2	9.3	22	24

Nineteen shells were examined. Within an apparently restricted range, the species is common. IREDALE (1935) stated that HEDLEY recorded a shell from West Australia under the name of *Cribraria teres*, but "fortunately" the shell proved to be a dead *Erronea caurica*. He added that THIELE recorded the species from the same western area. From Vlaming Head to Point Murat in Exmouth Gulf, dead shells are quite numerous on the beaches. As far as can be determined, it does not reach Roebuck Bay to the north nor Shark Bay to the south.

(*Ovatipsa* IREDALE, 1931)

39. *Cribraria* (*Ovatipsa*) *chinensis whitworthi* CATE, subsp. nov.

Localities 90, 59, 40, 53

COTTON (1935): N. W. Australia (as *Cypraea variolaria*)

SCHILDER (1941): North West Australia (as *O. chinensis sydneyensis*); 12, 7, 79

WEAVER (1960): 53 (as *C. chinensis chinensis*)

	L	W	H	lip	col
Largest shell:	40.7	24.4	20.2	17	15
Smallest shell:	24.2	14.7	12.0	16	13

Seventeen specimens were examined. The species is evidently reasonably common only at Vlaming Head. It is a deep water form, requiring a violent surf action to bring the shells in on the beach. We know of no live collected shells; three have been obtained with the dead animal in the shell and the others are dead beach shells in various states of preservation. The species has been collected only from the very restricted area directly below the lighthouse (five miles west and slightly south of the tip of North West Cape) where it washes up on the beach across a narrow shelf of rock that is seldom uncovered by the tide.

This species was recorded by COTTON (1950) as *Ovatipsa chinensis variolaria* (LAMARCK) in the B. E. Bardwell Collection, from North West Australia. SCHILDER (1941) also recorded it, as *Ovatipsa chinensis sydneyensis*, from this general area. A definite report can now be made





Figure 2a



Figure 1a

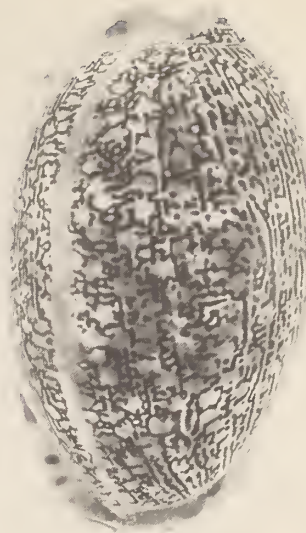


Figure 3a



Figure 2b



Figure 1b



Figure 3b

Figures 1 a, 1 b: *Arabica histrio westralis* IREDALE, 1935 ex C. N. Cate Coll., No. 2165; Hypotype 1 (natural size). Figures 2 a, 2 b: *Ovatipsa chinensis whitworthi* CATE, subsp. nov. ex C. N. Cate Coll., 2180; Holotype (natural size).

Figures 3 a, 3 b: *Arabica arabica brunnescens* CATE, subsp. nov. ex C. N. Cate Coll., No. 2164; Holotype (natural size).





for this subspecies as living at the above-listed stations.

#### Description:

The shell is generally large, solid, pyriformly elongate, narrowing perceptibly abapically, then abruptly to the anterior terminals; it becomes rounded and blunt adapically; base bulbously swollen; left side thickened, rounded; right margin thickened, calloused, sharply angled, keeled; aperture reasonably straight, wide, curving gradually left to the rear; front terminal barely produced, not at all adapically, semi-umbilicate above; outer lip broad, labial teeth large, heavy, well defined, long, evenly spaced; columella curving, teeth fine, very short; fossula narrow, shallow, only slightly concave, ribbed with teeth, faint to the rear, heavy anteriorly; terminal ridge well defined, curving slightly to the right; dorsal inductura glossy, light brownish-yellow, thickly patterned with variously sized beige-grey lacunae; thick, broad, beige-colored lateral callus sweeping high on either side, generally covering much of the dorsum; the sides and most of the base very thickly spotted with large, bright lavender spots; a weak, sometimes indistinct mantle line traversing the upper right dorsal surface; minimal base area and teeth a rich beige, the interstices brilliant orange.

#### Type locality:

The type locality is Vlaming Head (21°48' S. Lat., 114°07' E. Long.), North West Cape; the holotype will be deposited in the type collection at the Western Australian Museum, Perth, and will bear the catalog number W. A. M. 33-64.

In *Cribraria chinensis whitworthi* the shell is normally large, approaching the form of the east African *C. chinensis violacea* Rous, 1905. The West Australian shell is more heavily constructed. The long, shallow, narrow, heavily ribbed fossula is a consistent differentiating character in *C. c. whitworthi*. Perhaps the most outstanding feature of this new race is its brilliant lavender color and the size and density of the lateral spotting.

This species is named in honor of Mr. A. R. Whitworth of Geraldton, Western Australia, for his various contributions to our knowledge of the *Cypraea* living in the Dampierian Region.

*Ovatipsa chinensis sydneyensis* SCHILDER & SCHILDER, 1938, and *O. c. variolaria* (LAMARCK, 1810) are geographically remote and of different form. *Cypraea sydneyensis* is a narrower, more ovate shell, while that of *C. variolaria* is much larger and of lighter, less solid construction.

(*Cribraria* JOUSSEAUME, 1884)

40. *Cribraria* (*C.*) *cribraria fallax* (E. A. SMITH, 1881)

Ann. Mag. Nat. Hist., ser. 5, 8: 441

syn.: *Cypraea exmouthensis* MELVILL, 1888

Localities 90, 59, 40, 7, 43, 77, 31, 50

HEDLEY (1915): West Australia (ex E. A. SMITH, 1881)

IREDALE (1935): 40, Western Australia (T. H. HAYNES = *exmouthensis*), West Australia (ex E. A. SMITH, 1881)

SCHILDER (1941): North West Australia

STEADMAN & COTTON (1946): 40, West Australia

ALLAN (1956): 40, Dampierian to Flindersian Regions

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	34.5	22.0	17.6	19	20
Smallest shell:	16.7	10.2	8.1	17	14

Twenty-one shells were examined. This subspecies is fairly common within the range from Dirk Hartog Island to Gantheaume Point. IREDALE (1935) and STEADMAN & COTTON (1946) were of the opinion that *Cribraria fallax* and *C. exmouthensis* were separate races living together. It seems unlikely that racial distinction can be maintained with the species intermingling as freely as they seem to do. *Cribraria exmouthensis* was established on the basis of size, color, and lacunae -- characters that are commonly observed in series of the shells. MELVILL's (1888) remarks seem to add further uncertainty respecting this subspecies when he states "The dorsal covering matter seems to have been twice deposited, causing a very rich effect, with partial eclipse of the round white spots." Additionally, he suggests the smaller size of the shell (up to one inch) and more sparsely arranged white spots as differentiating characters. It might be added that some of the shells have a white dorsum devoid of any spotting. In my opinion, the earlier name *C. fallax* is the proper one for these shells.

Three large specimens, gathered by deep water divers, were brought in by pearling luggers from Lagrange Bay. These shells show the deep coloring mentioned by MELVILL, as well as the fewer white spots, but again this is not uncommon in any series of shells, particularly with the larger specimens found in any of these western shell colonies. One dead shell was dredged in from 80 to 85 fathoms off the north end of Dirk Hartog Island (WEAVER, 1960). This is one of several species of Cypraeidae in Western Australia that seems to thrive in either shallow or deep water.

#### Cypracinae

*Bernaya* JOUSSEAUME, 1884

41. *Bernaya catei* SCHILDER, 1963

The Veliger 5 (4): 127

Locality 92

	L	W	H	lip	col
Shell measurements:	75.7	49.4	39.8	23	17

A unique specimen was examined. The holotype (Cate Coll. C 563) was found after a storm by a crayfisherman in the spring of 1961. It was on the beach of the western shore of West Wallaby Island and still contained the fresh dead animal. SCHILDER (1963) disqualified it as *Cypraea venusta* SOWERBY, 1846 (CATE, 1962), and compared it with *Bernaya media* (DESHAYES, 1835), *B. cavata* (EDWARDS, 1865), *B. baluchistanensis* (NOETLING, 1897), and *B. brevis* (DOUVILLÉ, 1920), all from the Eocene of France and England, Upper Cretaceous of Pakistan and Libya, and Eocene of Nigeria, respectively.

(see *Zoila venusta venusta* SOWERBY, 1846 below)

*Zoila* JOUSSEAU, 1884

42. *Zoila venusta venusta* (SOWERBY, 1846)

Proc. Linn. Soc. London, pt. 1: 314

Synonyms:

*Cypraea thatcheri* COX, 1869

*C. roseopunctata* MELVILL, 1888

*C. Brunea* COX, 1889

*C. venusta* var. *brunea* [COX] HIDALGO, 1906

*C. venusta* var. *bakeri* GATLIFF, 1916

*C. episema* IREDALE, 1939

Localities 45, 18, 33

SOWERBY (1846): locality unknown

COX (1869): 28

MELVILL (1888): 29

COX (1889): 18

HEDLEY (1915) (*ex* COX, 1869): 28

GATLIFF (1916): locality unknown

IREDALE (1939): 18

SCHILDER (1941): 28

	L	W	H	lip	col
Largest shell:	80.9	49.5	43.1	24	9
Smallest shell:	74.6	49.5	40.3	27	8

Six shells were examined. This species is a deep water form and is uncommon to rare. The point of origin and center of concentration probably is southern Geographe Bay, and the range may or may not be continuous to Sorrento Reef, offshore just north of Perth; beyond this there is a reasonably abundant deep water variant (in from 15 to 70 feet). (see *Zoila venusta sorrentensis* SCHILDER, 1963 - next taxon)

Two typically formed *Zoila venusta*, though smaller in size (67.2 mm and 69.0 mm in length, respectively) and more or less identical with the Geographe Bay shells, were collected in 65 feet of water off Binningup Beach, approximately 70 miles south of Perth. There is no morphological evidence of these shells merging into the more northern *Z. sorrentensis* SCHILDER.

43. *Zoila venusta sorrentensis* SCHILDER, 1963

The Veliger 5 (4): 126; *ibid.* (1): plt. 3, figs. 1-3, and text fig. 2

Localities 82, 248

	L	W	H	lip	col
Largest shell:	60.9	40.1	32.9	26	11
Smallest shell:	53.0	34.6	27.8	23	10

Eight shells were examined. This new subspecies has been rather intensively collected in from 10 to 40 feet of water at Sorrento Reef, just north of Perth. It would probably be incorrect to say the shell was of common occurrence; however, many specimens are known to have been collected here with the aid of SCUBA diving equipment. It has heretofore been considered a variant of *Zoila episema* IREDALE, 1939 (see CATE, 1962). SCHILDER subsequently designated it as a race of *Z. venusta*. A dead beach specimen has been reported from the Abrolhos Islands. This locality record will need verification through additional field work.

44. *Zoila episema* IREDALE, 1939

Austral. Zool., 9 (3): 300; plt. 27, figs. 3-4

see *Zoila venusta venusta* (SOWERBY, 1846) above

45. *Zoila decipiens* (E. A. SMITH, 1880)

Proc. Zool. Soc. London for 1880: 482; plt. 48, fig. 8

Localities 7, 47, 80, 50, 70, 43

HEDLEY (1915): 71 (*ex* E. A. SMITH, 1880)

IREDALE (1935): West Australia

SCHILDER (1941): 7, 12, 79, 40, 71, 28

STEADMAN & COTTON (1946): Northwest Australia

ALLAN (1956): North-Western Australia

	L	W	H	lip	col
Largest shell:	60.1	40.5	36.0	23	18
Smallest shell:	50.9	34.0	31.5	22	17

Twenty-three shells were examined. This is a common deep water species, collected mostly by pearl divers. Dead shells are very seldom found washed up on the beaches. A Japanese diver has mentioned finding four black specimens among 500 *Zoila decipiens* he collected during one season of diving.

46. *Zoila rosselli* COTTON, 1948

Trans. Roy. Soc. S. Austral., 72 (1): 30; plt. 1

Localities 42, 78, 46, 9

ALLAN (1956): 42, 26

	L	W	H	lip	col
Shell measurements:	58.3	38.6	27.9	31	26

One shell examined (Cate Coll. no. 1351) This specimen is one of Mr. Rossell's six original paratypes. The



type lot was collected in 1916 from dredged rubble adjacent to the North Wharf (Leighton Beach), Fremantle. The holotype is on deposit in the South Australian Museum, Adelaide (Cat. no. D 14220).

In March 1962, Max Shaw, with the aid of an aqua lung, descended 220 feet to the ocean bottom in the vicinity of Rottneet Island near Perth to collect what is probably the first live specimen known. It was living on fan coral. This species has also more recently been collected alive in Geraldton Harbor (Max Cramer Coll.). This would indicate a new northern range extension for *Zoila rosselli*. Barry Wilson (personal communication) reported three live-taken shells collected at 35 fathoms, presumably off Perth; two of these are now in the collection of the Western Australian Museum.

47. *Zoila friendii friendii* (GRAY, 1831)

Zool. Misc., 1: 35

syn.: *Cypraea scottii* BRODERIP, 1831

Localities 55, 45, 24, 10, 87, 42, 20, 44, 78

HEDLEY (1915): 87 (*ex* REEVE, 1845)

IREDALE (1935): 87

SCHILDER (1941): 45, 42, 87

STEADMAN & COTTON (1946): 87 (= *scottii* BRODERIP, 1832 [*sic*])

WEAVER (1960): 44, 78

	L	W	H	lip	col
Largest shell:	86.6	44.2	33.3	26	7
Smallest shell:	45.6	26.5	21.3	19	4

Seventeen shells were examined. This species is fairly uncommon in collections because of its deep water habitat. The shell is long and narrow, broadening gradually to the rear, where it narrows abruptly to the apical terminal collar. The greyish-brown dorsum is densely covered with variously sized large, blurred brown spots; sides, margins, base and interstices are dark brown; teeth, fossula, columella and inner terminal walls are white. The terminals are prominently produced, posteriorly sharp-edged; the morphological features of the aperture are weakly developed and incomplete, particularly the columellar teeth and simple fossula.

The species is rather widely distributed from Perth south to Albany. Specimens have been collected at Clifton's Main Reef in Geographe Bay at five fathoms on sand and shale bottom, living on soft orange-yellow sponge; at Clifton's Reef, Outer Knob, in 2½ fathoms at edge of reef on a patch of purple limestone; at Ludlow Beach in five fathoms on limestone reef two specimens were taken, one attached to the ceiling, another on the sandy floor under the ledge of a crayfish tunnel; others were collected in Cockburn Bay between Fremantle and Garden Island, in 25 feet of water on yellowish-brown sponge growing on mussel-encrusted pilings to which submarine nets had

been attached during the last war. The water temperature at this station was between 63° and 64° F. Eleven shells were collected within an hour. (*ex* diary, C. S. Weaver)

48. *Zoila friendii vercoi* SCHILDER, 1930

Zool. Anzeiger, 1930: 74

Locality 2

IREDALE (1935): West Australia; South Australia

SCHILDER (1941): 38, 2

STEADMAN & COTTON (1946): 38

ALLAN (1956): Western Australia

	L	W	H	lip	col
Shell measurements:	83.3	53.1	39.0	26	10

Two shells were examined. The specimen measured (Cate Coll. C 1706) is typical of the subspecies. The morphological difference that separates this race from the nominate *Zoila friendii friendii* is that the shells, on the average, appear larger and flatter, with greater shell width a significant feature of the shell's morphic change (63% of the length in this instance). Also, the terminals are stubbier, the coloring is less intense and more diffuse. The holotype (D969) and two paratypes are in the South Australian Museum. Three specimens are reported to be in the H. Russell Collection (COTTON, 1950).

49. *Zoila marginata* (GASKOIN, 1849)

Proc. Zool. Soc. London for 1848: 91

Localities 63, 48, 92, 76, 51

	L	W	H	lip	col
Hypotype 1:	47.5	29.1	23.5	27	18
Hypotype 2:	53.9	31.5	26.1	28	21
Hypotype 3:	54.0	31.4	25.2	27	24

Three shells were examined (Cate Coll. C 906, C 2516, and T. Bratcher Coll., 2215). Hypotype 1 has been previously recorded (CATE, 1961). Hypotype 2, a live-collected specimen was found in a craypot set by the motor vessel IRIS in 30 fathoms at Houtman Rocks. It is a mature, fully developed shell, while Hypotype 1, though well formed, is subadult. This latter specimen was used to establish a type locality for the species at Albany, southwest Australia (CATE, 1961). It appears now that the locality data for that shell are questionable. Verified subsequent collections of the species clearly show the Houtman Abrolhos Islands as the true locality; I therefore correct the type locality of *Zoila marginata* to Pelsart Island, Houtman Abrolhos Group.

Until 1961 little seemed to be known about this rare species, but in the last two years a number of specimens have been taken in craypots in various localities such as in 40 fathoms off Snag Island, 100 miles south of Geraldton (*leg.* Edward Nickels); Lancelin Island; 28 fathoms, 7 or 8 miles south of Long Island, southern group, Abrolhos

Islands (T. Bratcher Coll. 2215); and Max Cramer of Geraldton has had at least five live-collected shells — so that what once was an obscure species seems to be well substantiated now.

*Luria* JOUSSEAUME, 1884

(*Basilitrone* IREDALE, 1930)

50. *Luria* (*B.*) *isabella rumphii*

SCHILDER & SCHILDER, 1938

Proc. Malac. Soc. London, 23(3-4): 177

Localities 90, 59, 40, 73 to 60

HEDLEY (1915) (*ex* MENKE, 1843), IREDALE

(1935), ALLAN (1956): Western Australia

SCHILDER (1941): North West Australia

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	26.2	14.7	12.2	32	24
Smallest shell:	20.0	11.1	8.9	21	16

Five shells were examined. The species is not common. Not much is yet known of this group except that the shells seem to be smaller than the average for the typical species.

*Talparia* TROSCHER, 1863

(*Arestorides* IREDALE, 1930)

51. *Talparia* (*A.*) *argus argus* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 719

Localities 90, 65, 73, 59, 40

SCHILDER (1941): 7, 12, 79

	L	W	H	lip	col
Largest shell:	61.8	32.7	25.3	39	36
Smallest shell:	59.2	29.3	23.0	37	36+
				[immature]	3

Three shells were examined. The species is fairly rare. One specimen was washed up on the shore, freshly dead. Two others were collected as semi-worn beach specimens between Vlaming Head and Point Murat, Exmouth Gulf. The broken fragment of a fourth shell was observed at Vlaming Head half buried in the sand but was not collected. If the size of these specimens is any criterion for the west coast of Australia, they are small for the species when compared, for example, with the northeast Australian shells from Thursday Island (L 90.5, W 48.6, H 38.1, lip 47, col 39).

(*Talparia* TROSCHER, 1863)

52. *Talparia* (*T.*) *talpa talpa* (LINNAEUS, 1758)

Syst. Nat., Ed. 10, p. 720

Localities 90, 59, 40, 65

COTTON (1950): Fort George, Western Australia

(B. E. Bardwell)

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	76.5	42.4	39.1	44	45
Smallest shell:	59.5	33.4	27.5	43	44

Three shells were examined. The species is uncommon. The third shell in this series is a large bulla specimen (L 71.3, W 39.6, H 32.3, lip 44, col 44) conveying the impression that the shells in Western Australia are generally large, comparing favorably with the northern races. The living range is not yet fully determined for this species.

*Mauritia* TROSCHER, 1863

(*Arabica* JOUSSEAUME, 1884)

53. *Mauritia* (*A.*) *eglantina perconfusa* IREDALE, 1935

Austral. Zool., 8 (2): 108

*ibid.* 9: plt. 18, figs. 1-2

Localities 7, 77, 11, 40

IREDALE (1935), STEADMAN & COTTON (1946):

West Australia

SCHILDER (1941): 40, 71, 28

	L	W	H	lip	col
Largest shell:	67.0	40.0	33.7	39	32
Smallest shell:	57.4	34.3	27.2	36	31

Ten shells were examined. The species is fairly common. Some authors have included these Western Australian shells with those of the eastern race *Mauritia* (*Arabica*) *eglantina coutourieri* (VAYSSIÈRE, 1905). Though there may be merit in this approach, I consider that the Dampierian shells exhibit a peculiar endemism that is common to many West Australian species. For this and other minor morphic reasons, I am retaining the IREDALE name for this race of *M. eglantina*. VAYSSIÈRE's *A. coutourieri* seems reasonably restricted to an already very extensive range from Japan through southeastern Malaysia, and into Java and New Britain. *Mauritia* (*A.*) *perconfusa* on an average appears to be a larger form; the teeth are continuous on either side along a straight, narrow aperture; the margins and base are a darker, smoky, rose-beige color; the mantle line is noticeably broader and more distinct than that seen in the northern races. These larger shells, proportionately, have a greater number of labial and columellar teeth. I have been unable to find that IREDALE indicated the type locality and will therefore designate Broome, Roebuck Bay (17°59' S. Lat., 122°14' E. Long.) as such.

54. *Mauritia* (*Arabica*) *arabica brunnescens* CATE, subspec. nov.

Synonyms:

*Arabica westralis* IREDALE, 1935, p. 108

*Mauritia* (*Arabica*) *westralis*, SCHILDER & SCHILDER, 1941, p. 85



Localities 7, 77, 11, 90, 59, 40, 73 to 72

HEDLEY (1915) (*ex* MENKE, 1843), IREDALE (1935), STEADMAN & COTTON (1946): Western Australia

SCHILDER (1941): 7, 12, 79

ALLAN (1956): Western Australia

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	69.1	41.2	32.6	30	23
Smallest shell:	54.8	35.2	28.7	28	24

Seventeen shells were examined. This subspecies has been found to be common in Roebuck Bay. At present, however, little is known of its range north of Price's Point, but south to Quobba Point the species seems to be fairly well established. IREDALE (1935), in naming the northwest Australian form of *Arabica histrio* GMELIN, 1791, used the designation *Arabica westralis* for his species, apparently in error. SCHILDER & SCHILDER (1938-39) appear to have misunderstood IREDALE's intention, thinking he was referring to the true *A. arabica*, and subsequently used *A. westralis* incorrectly for these northwest Australian shells. IREDALE (1939) clarified his use of the name *A. westralis*, which in turn permitted SCHILDER (1941; July 1961) to disregard the unavailable *A. arabica westralis*. It is my considered opinion, however, that geographic isolation, color, and morphological changes in these shells provide valid reasons for further taxonomic consideration. Among other noticeable racial characters, the shells are uniformly larger and heavier, and in this respect seem more closely to approach the east African *M. arabica immanis* SCHILDER & SCHILDER, 1939. The distinctly brown dorsum is typical, and the base and sides of these Dampierian shells are almost white when compared with the orange to orange-brown seen in the other races.

#### Description:

Shells uniform in appearance, large, solid, cylindrically humped, sloping to the front, blunt to the rear, somewhat bulbously inflated, with the terminals only slightly attenuate, most so in front; margins thickened, excurvate; flattened, flanged abapically; sides steep, concave; base and lip surface narrow, flattened; aperture straight, narrow, widening and constricted in front, curving gradually left at rear; labial and columellar teeth short, strong, well defined, and barely reaching the base from within; interstices deep; fossula large, long, deeply grooved, ribbed with the extended inner lip teeth; terminal ridge straight, defined on either side of the front aperture with parallel brown ridges; color of shell and margins primarily white to light rose-beige, margins irregularly patterned with large, diffuse black spots; terminal collars smudged with grey-black, dorsum covered with chestnut brown ornamentation consisting of broken parallel lateral lines, some interrupted with lacunae of basic shell color; fossula

white; columella white with darker shell color visible through the translucent surface; base and interstices off-white to pinkish-beige; teeth brown. A broad mantle line traverses the length of the upper right dorsum.

#### Type Locality:

The type locality is Broome, Roebuck Bay. The holotype will be deposited in the Western Australian Museum, Perth. Its catalog number will be W. A. M. 32-64.

55. *Mauritia (A.) histrio westralis* (IREDALE, 1935)

Austral. Zool., 8 (2): 108

syn.: *Arabica westralis* IREDALE. Austral. Zool., vol. 8, pt. 2, p. 108

Localities 7, 77, 66, 40, 5, 68

HEDLEY (1915): 79 (*ex* BRAZIER, 1882) as *reticulata* MARTYN, 1782

IREDALE (1935), STEADMAN & COTTON (1946), ALLAN (1956): "Western Australia"

SCHILDER (1941): 7, 12, 79

WEAVER (1960): 53

#### Dimensions of Northwest Australian shells

	L	W	H	lip	col
Largest shell:	71.6	47.6	35.7	30	26
Smallest shell:	64.4	43.8	35.0	33	25
Average (10 shells):	70.2	45.9	35.2	30	24

#### Lemurian shells (SCHILDER Prodrôme measurements):

	L	W	H	lip	col
	57.0	33.8		25	20

#### Lemurian shells (Cate Coll. Nos. 1660, 2151)

	L	W	H	lip	col
Largest shell:	60.9	39.3	33.0	34	23
Smallest shell:	45.1	26.0	21.2	30	23
Average (4 shells):	53.2	32.7	27.0	32	25

#### Cerf Island, Seychelle Islands (Cate Coll. No. 1806)

	L	W	H	lip	col
Largest shell:	44.0	24.0	19.9	32	26
Smallest shell:	40.7	22.8	18.6	32	24
Average (4 shells):	42.1	26.7	18.9	31	25

Ten shells were examined. The species is common in Roebuck Bay. Although *Arabica histrio* is clearly distinct, one is impressed by the resemblance of this species to certain others as to morphology, color, and ornamentation, so much so that one wonders if they are not all allopatric races of a common stock. *Arabica histrio*, *A. depressa* GRAY, 1824, *A. grayana* SCHILDER, 1930, and *A. maculifera* SCHILDER, 1932 adapt themselves well to a concept of racial division of a species. One significant trait is the presence of a broad, brown color banding, noticeable in the above species as a constant background to the surface markings that, among other things, seems to link the

species together. It is not clear why IREDALE (1935) disregarded and failed to recognize *A. histrio* in describing his *A. westralis*. The omission becomes more conspicuous with his use of *A. arabica* (LINNAEUS, 1758) and *A. eglantina* (DUCLOS, 1833) for comparison with his new taxon.

The *Cypraea histrio* of GMELIN ranges in a northern arc from East Africa to India, Andaman Islands, Cocos Keeling Island, Southwest Java, and southward into North-western Australia. Authors have suggested that there is no difference between the Lemurian *Arabica histrio* and comparable shells from Malaya. This could be so, but in the Seychelle Islands, and in the Dampierian region, there exists a significant difference in the species. The Cerf Island specimens -- a series of four with all the identifying characters of *A. histrio* -- reveal an interesting story in shell statistics. They are surprisingly small, short, narrow, and the teeth are correspondingly finer. All of the shells are fully adult and well developed. In the East African *A. histrio*, s. s., there is an equal degree of variation in size, shell shape, and color. One can even detect a color, marking, and morphological gradation into the species *A. grayana* SCHILDER, 1930.

The southeastern end of the cline seems to be reached in the West Australian region. However, of all the specimens I have had for comparison the smallest is larger than those from anywhere else. A bulla specimen measures 66 millimeters. Although the ornamental markings on the shell are much the same, the overall change in the species is reminiscent of the change found in *Cypraea tigris schilderiana* CATE, 1961. The shells are much heavier in structure, the marginal callus is rounded, more ponderous, thicker, more heavily flanged, and -- possibly inconsequentially -- the characteristic spire blotch appears larger, normally six millimeters in diameter.

It therefore would seem these Northwest Australian shells deserve the recognition IREDALE had in mind for them (see IREDALE, 1939, pl. 28, figs. 3 and 4).

*Cypraea* LINNAEUS, 1758

(*Cypraea* LINNAEUS, 1758)

56. *Cypraea* (C.) *tigris pardalis* SHAW, 1785

Vivar. natur. Misc., 6, plt. 193

Localities 7, 77, 73, 90, 40, 17

HEDLEY (1915) (ex MENKE, 1843), IREDALE

(1935): West Australia

SCHILDER (1941): 7, 12, 79

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	93.5	60.9	47.4	30	21
Smallest shell:	84.7	60.0	46.6	25	24

Four shells were examined. The species is relatively uncommon. More *Cypraea tigris pardalis* are evidently

found during July and August than at any other time of the year; this seems to hold true at Exmouth Gulf and at North West Cape. Representative specimens from Quobba Point and Cape Leveque are in the Whitworth Collection, Geraldton. An interesting note is that *C. tigris pardalis* and *Arabica histrio* (GMELIN, 1791) are often found together.

(*Lyncina* TROSCHER, 1863)

57. *Cypraea* (L.) *lynx vanelli* LINNAEUS, 1758

Syst. Nat., Ed. 10, p. 720

Localities 40, 7, 77, 11, 73, 17

HEDLEY (1915) (ex MENKE, 1843): Western Australia

IREDALE (1935): West Australia

SCHILDER (1941): 7, 12, 79

ALLAN (1956): North-West Australia

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	52.3	30.6	26.3	29	20
Smallest shell:	29.2	17.7	15.0	24	18

Nine shells were examined. The species is common, with the center of distribution apparently at Roebuck Bay. The largest specimens are from Broome, and the smaller shells come from Exmouth Gulf.

58. *Cypraea* (L.) *vitellus vitellus* LINNAEUS, 1758

Syst. Nat., Ed. 10, p. 721

Localities 81, 17, 40, 7, 77, 11

HEDLEY (1915) (ex MENKE, 1843), IREDALE (1935): West Australia

SCHILDER (1941): 7, 12, 79

COTTON (1950): 52 (56.0 mm)

ALLAN (1956): Dampierian Region

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	71.0	43.9	37.7	31	27
Smallest shell:	28.5	20.2	16.8	22	18

Four specimens from Cable Beach, three from Exmouth Gulf and four from Broome were examined. These shells are not plentiful at Broome, but a few are found from time to time, as is the case also at Cable Beach. From the number of dead shells washed in to the beaches, the species seems to be more plentiful in the North West Cape -- Exmouth Gulf area.

59. *Cypraea* (L.) *reevei* SOWERBY, 1832

Conch. Illust., fig. 52 (London)

Localities 78, 10, 87, 83, 89a

HEDLEY (1915): 44 (ex REEVE, 1845)

IREDALE (1935): West Australia

STEADMAN & COTTON (1946): Western Australia

SCHILDER (1941): 45, 42, 87, 72

ALLAN (1956): Southwestern Australia



	L	W	H	lip	col
Largest shell:	42.0	27.6	24.2	31	23
Smallest shell:	26.4	15.5	13.3	28	21

Eleven shells were examined. This uncommon species lives well beyond the low tide mark in deep water and seems nearly always to exhibit varying degrees of damage and wear. The anterior terminal edges are often broken, the dorsum is seldom found without the effects of wave and sand action, because the shells are usually picked up on the beach after storms. A live collected shell is a rarity. Though predominantly a southern species, it does range into Western Australia. Three live specimens were collected in craypots from 15 fathoms off Turtle Dove Shoal, 37 miles west south west of Dongara. Dead shells have been picked up at Geraldton and adjacent beaches. These northern shells seem to be smaller and more globular than those from Swan River and southward.

60. *Cypraea* (L.) *carneola carneola* LINNAEUS, 1758

Syst. Nat., Ed. 10, p. 719

Localities 66, 40, 7, 77, 89a

HEDLEY (1915): 46 (ex VERCO, 1912)

SCHILDER (1941): 7, 12, 79, 68, 69, 22

WEAVER (1960): 53

	L	W	H	lip	col
Largest shell:	37.2	22.4	19.2	29	23
Smallest shell:	22.1	14.0	11.7	22	21

Thirteen shells were examined. Despite the relatively large number of specimens collected for this study, the species is fairly uncommon in the Exmouth Gulf area, and even more scarce in Roebuck Bay. Cumulatively, the shells average comparatively smaller than those collected on the eastern Australian coast. This species seems to be more abundant at certain seasons than at others.

### Explanation of Table 1

The occurrence of the cypraeid species in Western Australia as reported by various authors is listed in Table 1. The columns, arranged arbitrarily, are designated as follows:

Column 1 (C) CATE, 1964 (this report)

Column 2 (S) SCHILDER, 1963

(personal communication)

Column 3 (I) IREDALE, 1935, 1939

Column 4 (W) WEAVER, 1960

Column 5 (A) ALLAN, 1956

Column 6 (Co) COTTON *et al.*, 1946, 1950

The systematic arrangement used in Table 1 and in the text follows that of SCHILDER & SCHILDER, 1939.

	C	S	I	W	A	Co
<i>Pustularia</i> SWAINSON						
<i>bistrinotata bistrinotata</i>				+		
<i>cicercula cicercula</i>	+	+		+		
<i>globulus globulus</i>	+		+			
<i>Staphylaea</i> JOUSSEAUME						
<i>limacina facifer</i>	+	+				
<i>nucleus nucleus</i>	+			+		
<i>staphylaea staphylaea</i>	+			+	+	+
<i>Erosaria</i> TROSCHEL						
<i>caputserpentis kenyonae</i>	+	+		+		+
<i>caputserpentis reticulum</i>	+	+				
<i>cernica viridicolor</i>	+	+	+			
<i>erosa purissima</i>	+	+	+	+		
<i>helvola citrinicolor</i>	+	+	+	+	+	+
<i>labrolineata labrolineata</i>	+	+				
<i>poraria poraria</i>	+	+			+	
<i>miliaris diversa</i>	+	+	+		+	+
<i>wilhelmina</i>			+			+
<i>Monetaria</i> TROSCHEL						
<i>annulus annulus</i>	+	+				
<i>moneta rhomboides</i>	+	+	+	+	+	
<i>Erronea</i> TROSCHEL						
<i>caurica blaesa</i>	+	+	+		+	+
<i>cylindrica sowerbyana</i>	+	+	+	+	+	+
<i>errones proba</i>	+	+	+	+	+	
<i>ovum ovum</i>	+	+				
<i>pyriformis smithi</i>	+	+			+	+
<i>subviridis dorsalis</i>	+	+	+			
<i>walkeri continens</i>			+			
<i>angustata</i>						+
<i>Notocypraea</i> SCHILDER						
<i>declivis</i>		+	+		+	+
<i>pulicaria</i>	+	+			+	
<i>Palmadusta</i> IREDALE						
<i>asellus asellus</i>	+	+	+		+	+
<i>clandestina clandestina</i>	+	+	+	+	+	
<i>fimbriata fimbriata</i>	+	+		+		
<i>gracilis hilda</i>	+	+	+		+	+
<i>hammondae</i>	+	+	+			
<i>lutea bizonata</i>	+	+	+		+	+
<i>punctata punctata</i>		+	+	+		
<i>saulae saulae</i>	+					
<i>ziczac ziczac</i>	+	+		+		
<i>Blasicrura</i> IREDALE						
<i>hirundo cameroni</i>	+	+	+	+	+	
<i>pallidula simulans</i>	+	+	+		+	
<i>quadrimaculata thielei</i>	+	+	+		+	+
<i>stolida stolida</i>	+	+				
<i>stolida brevidentata</i>	+	+		+		